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Published in:
Journal of Occupational Rehabilitation

DOI:
10.1007/s10926-012-9384-y

Publication date:
2013

J Occup Rehabil (2013) 23:74–81
DOI 10.1007/s10926-012-9384-y

ORIGINAL PAPER

Prognostic Factors for Sustained Work Participation in Early Osteoarthritis: A Follow-Up Study in the Cohort Hip and Cohort Knee (CHECK)

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Published online: 28 August 2012

Abstract *Objective* To identify prognostic factors for the 2-year course of work participation in early osteoarthritis (OA) of hips or knees. *Methods* In this prospective cohort study, questionnaire data from 925 subjects was analyzed. Rate ratios were calculated to compare work participation with the general Dutch population, corrected for age, sex and education. The overall participation rate at T_2 was compared to baseline. Personal factors, self-reported health status (Western Ontario McMasters Arthritis Index—WOMAC), medical consumption and physical work demands were compared between subjects with sustained work participation and subject who stopped working; factors that differed significantly were included in a logistic regression analysis. *Results* Work participation in the cohort (mean age 58, 79 % females) decreased from 51 to 46 %, a similar rate to the general population. Subjects who continued working were younger than those who stopped working (mean 4.2 years) and they had less frequently reported sick-leave at baseline; the regression model included both factors. 11 % Of the workers reported sick-leave in the past year because of hip/knee complaints (similar to baseline). 20 % Reported work adaptations, compared to 14 % at baseline. *Conclusion* The 2-year course of work participation of people with early OA was similar to the general Dutch population. Sustained work participation was predicted by lower age, not by OA related factors.

Keywords Osteoarthritis · Knee · Hip · Work participation · Cohort

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Introduction

Arthritis is frequently reported to be one of the most disabling diseases, causing a high socioeconomic impact [1, 2]. When discussing the impact of arthritis authors often draw conclusions on both rheumatoid arthritis (RA) and osteoarthritis (OA), although there is much more information on RA than on OA in this respect [3]. The financial burden of these diseases consists of direct health care expenses and indirect costs, for example due to reduced work productivity and absenteeism [4–6]. Regarding future demands on the health care system, osteoarthritis is often labeled as one of the diseases with the highest impact, because of its increasing prevalence in societies faced with ageing populations and higher proportions of overweight people. However, in most studies only small numbers of subjects with OA in the working age have been included and this raises questions about the validity of findings concerning the effect of OA on work.

Well documented information on the impact of OA on work participation is scarce [7]. Differences in study design and populations, as well as international differences in systems of health insurance and social security, make it difficult to gain consensus on the extent of the impact of OA on work participation. Patients, employers and health care professionals need a better understanding of the impact to develop evidence based strategies and interventions that can support individuals with OA to stay at work. Paid work is an important aspect of social participation [8, 9] and a contribution to society with an increasing economic necessity. Therefore, factors which determine work participation or which precede leaving the work force need to be identified. The main objective of this 2-year follow-up (T_2) study nested in the Cohort Hip and Cohort Knee (CHECK) on early OA was to document the longitudinal course of work participation and identify differences in characteristics between subjects who continued working and subjects who stopped working.

Methods

Design

An inception cohort of 1002 participants with pain and/or stiffness of hip and/or knee (CHECK—Cohort Hip and Cohort Knee) [10] was formed for a 10 year prospective study. These participants were identified in ten medical centers in the Netherlands. The medical ethics committees of all centers approved the cohort study and all participants gave written informed consent before entering the study. In this paper 2-year follow up data are presented (T_2; the year 2007 for most participants) and compared with baseline data (T_0; 2005 for most participants) [11]; the course of work participation, sick-leave and work adaptations are described.

Study Population

An individual was eligible for inclusion in the cohort if he or she was aged 45–65 years old, had pain and/or stiffness of hip and/or knee and consulted their general practitioner for these symptoms in the 6 months prior to baseline for the first time. Exclusion criteria were: other pathological condition than OA that explained the existing complaints, other rheumatic disease, previous hip or knee joint replacement, congenital dysplasia, osteochondritis dissecans, intra-articular fractures, septic arthritis, Perthes' Disease, ligament or meniscus damage, plica syndrome, Bakers cyste, severe co-morbidity, malignancy in the last 5 years and inability to understand the Dutch language.

Measurements

Subjects were classified according to the Kellgren and Lawrence (K&L) rating score for radiological OA [12] at baseline and at T_2. All other data in this study were collected at both measurements from a comprehensive self administered questionnaire (in Dutch) that was composed of a set of validated instruments. Several aspects of work participation (present or last job, work hours, working history, present working status, sick leave, physical work demands) were measured using the 'Economic Aspects in Rheumatoid Arthritis' questionnaire [13]. Labour force participation was defined as having a paid job for 8 h or more per week. Participants with paid employment were asked if they had been on sick leave, and if so, if this was because of hip/knee complaints or for other health reasons. Another question was whether they had adapted or would like to adapt their work (hours, tasks, workplace). Subjects without paid work were asked for reasons for not having a job.

Self-reported health status was measured using the Dutch versions of the Short Form-36 Health Survey (SF-36, [11, 14, 15]) and the Western Ontario and McMasters University Arthritis Index (WOMAC [16, 17]). The SF-36 consists of 8 subscales with a score range of 0–100, the maximum score of 100 indicates the best health situation. The WOMAC has a total score range of 0–96, the maximum score of 96 indicates the worst health situation (maximal restrictions). The total score is a summation of the scores on 3 subscales, for pain (0–20), stiffness (0–8) and physical function (0–68).

Regarding medical consultation because of the hip and knee symptoms, subjects were asked to indicate whether they had visited any professionals from a list of health care professions.

Analysis

All statistical analyses were performed with SPSS-16. The results of the CHECK questionnaire on work participation were compared with data from the general Dutch population [18]. Work participation rate ratios (CHECK/general population) with 95 % confidence interval (CI) were calculated for subjects not older than 65 years. If a CI included the value of 1.0 this indicated that there was no statistically significant difference between the rates ($p < 0.05$). To correct for confounding by age, sex and education level, the data were stratified for these factors. Age was stratified into groups of 5 years, in accordance with the population data. The highest attained education level was divided in 3 categories: primary, secondary and higher education.

The course of work participation in the cohort was described as the difference in the participation rate at T_2 and at T_0, as a result of subjects either remaining at work or leaving the work force. To identify explanatory factors for this course, the factors age, sex, education level, Body Mass Index (BMI), self-reported health status, medical consumption and physical job demands of the respective groups were compared. Independent *t* tests were used for the continuous variables, applying Bonferroni corrections for multiple comparisons, χ^2 test for frequencies (Fisher exact in case of cells with less than 5 expected). Differences between T_2 and T_0 within the groups were tested using paired *t* tests. Variables that showed significant differences between the groups, were included simultaneously in a multivariate logistic regression analysis to examine relationships with leaving the work force. The backward LR method was used and goodness-of-fit was tested with the Hosmer–Lemeshow test.

For subjects with paid employment the point prevalence of sick-leave (at moment of filling out the questionnaire) and the incidence of sick-leave during the past 12 months were determined at T_2, as well as the frequency of work adaptations (actualized and desired), and compared to baseline.

Results

925 subjects filled out the sections on work in the questionnaire at 2-year follow-up, compared to 970 at baseline (Fig. 1). There were no systematic differences regarding age, sex, education level and self-reported health between subjects who completed the questionnaire at follow-up and those who did not.

Mean age of the subjects at T_2 was 58 years, 79 % were females. Among the subjects 41 % had knee complaints only, 17 % had only hip complaints, 42 % had complaints of both hip and knee. Based on the classification by the Kellgren and Lawrence (K&L) rating score [12] the proportions of subjects with radiological osteoarthritis (K&L >1) of the knee at T_0 and T_2 were 4 and 6 %, respectively, and 7 and 12 % for the hip, indicating that CHECK is indeed an early OA cohort. However, 76 % of the patients with knee symptoms could be diagnosed as OA according to the clinical ACR criteria for classification of OA [19]. Only a minority of CHECK participants with hip symptoms (24 %) fulfilled the clinical classification criteria of hip OA [20]. Work participation for subgroups in CHECK compared to the general population is presented in Table 1.

For subjects with secondary and higher education the participation rate in CHECK was similar to the general population (all 95 % CI's included the value of 1 for the ratio's). A valid comparison of the group for those who attended primary school only was not feasible, because there were only six males and 18 females in this stratum. In all but one of the strata (higher educated subjects older than 65) work participation of males was higher compared to females. Work participation decreased with age and was higher in higher education levels. Of the 125 subjects aged over 65, seven (6 %) reported still doing paid work. Since the Dutch statistics assume that people retire at an age of 65, this figure could not be compared.

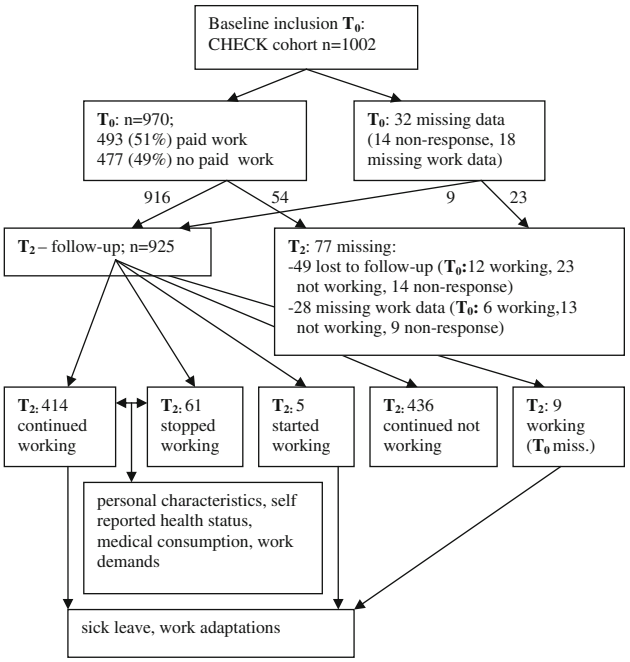

Fig. 1 Flow diagram of the study design

Longitudinal analyses regarding subjects staying in the work force and those dropping out could be described using data on 475 subjects (Fig. 1); 414 (87 %) continued to work and 61 (13 %) stopped working; the five subjects (re-)entering the work force were not included here because of their very small number. They were however, just as the additional nine who were missing at baseline, included in the T_2 analyses regarding comparison with the general population, the sick leave and work adaptations. There were 436 subjects who did not have paid work at both measurements. As a result the course of work participation decreased from 51 % at T_0 to 46 % (428 out of 925) at T_2.

The comparison between the 61 subjects who had stopped working and those who continued to work at T_2 showed that the former were on average 4.2 years (95 % CI 3.1–5.3) older (Table 2). Twelve of them (20 %) had reported being at sick-leave at T_0, mainly due to other complaints than hip or knee, compared to twenty-four (6 %) of those who continued working (Table 3).

Table 1 Work participation rates (%) and ratios, stratified for education level, age and sex in the CHECK cohort at 2-year follow-up and in the general Dutch population

	Males			Females		
	CHECK rate % (n)	Dutch rate %	Rate ratio (95 % CI)	CHECK rate % (n)	Dutch rate %	Rate ratio (95 % CI)
Primary school						
Age 45–49	– (–)	81	–	– (–)	49	–
50–54	100 (2)	78	1.28 (0–3.79)	50 (2)	42	1.19 (0–3.52)
55–59	100 (1)	67	1.49 (0–4.42)	50 (8)	29	1.72 (0.03–3.41)
60–64	33 (3)	24	1.39 (0–4.11)	25 (4)	8	3.13 (0–9.25)
≥65	– (–)			25 (4)		
Secondary school						
Age 45–49	100 (6)	87	1.15 (0.23–2.07)	90 (29)	72	1.25 (0.77–1.72)
50–54	91 (32)	86	1.05 (0.67–1.44)	69 (112)	65	1.06 (0.82–1.29)
55–59	61 (38)	74	0.82 (0.48–1.15)	44 (167)	50	0.89 (0.68–1.09)
60–64	39 (31)	30	1.29 (0.56–2.02)	18 (136)	15	1.23 (0.75–1.71)
≥>65	0 (17)			3 (71)		
Higher education						
Age 45–49	100 (5)	93	1.08 (0.13–2.02)	78 (9)	83	0.94 (0.24–1.64)
50–54	100 (8)	91	1.10 (0.34–1.86)	74 (43)	79	0.94 (0.62–1.27)
55–59	63 (16)	79	0.79 (0.30–1.29)	72 (76)	63	1.15 (0.85–1.45)
60–64	32 (25)	34	0.94 (0.29–1.59)	28 (47)	25	1.11 (0.50–1.71)
≥65	8 (13)			15 (20)		
	197			728		

Table 2 Comparison of personal factors and self-reported health status of subjects still working and subjects who stopped working, both at T_0 and T_2

	Still working n = 414 Mean (SD)	Stopped working n = 61 Mean (SD)	Stopped—Still working Mean difference (95 % CI)
Sex (female)	75 %	74 %	
Age			
T_0	53.0 (4.2)	57.2 (3.6)	4.2 (3.1–5.3)
T_2	55.1 (4.3)	59.3 (3.6)	4.2 (3.1–5.3)
BMI			
T_0	25.9 (3.8)	26.2 (3.6)	0.3 (−0.7 to 1.3)
T_2	25.9 (3.9)	26.1 (3.9)	0.2 (−0.8 to 1.3)
WOMAC:			
Pain			
T_0	4.5 (3.2)	4.3 (3.4)	−0.2 (−1.1 to 0.7)
T_2	4.1 (3.2)	4.1 (3.5)	−0.1 (−0.9 to 0.8)
Stiffness			
T_0	2.5 (1.6)	2.3 (1.7)	−0.2 (−0.7 to 0.2)
T_2	2.3 (1.7)	2.2 (1.6)	−0.1 (−0.5 to 0.4)
Function			
T_0	14.1 (10.6)	15.2 (12.4)	1.1 (−1.8 to 4.0)
T_2	13.3 (11.1)	13.5 (12.0)	0.3 (−2.7 to 3.3)

There was no significant difference for any other factor compared to those who continued working. The logistic regression analysis resulted in a model with age (OR 0.77/year, 95 % CI 0.71–0.88) and sick leave at T_0 (OR 0.27, 95 % CI 0.11–0.65) as determining factors for continuation of work (Hosmer and Lemeshow test: $\chi^2 = 9.2$, $p = 0.33$, indicating a good model fit). The majority (79 %) of the 61 subjects who stopped stated that being a housewife/-man, being a pensioner, doing voluntary work or combinations of these factors was the reason. Only 2 of them (3.6 %) reported their hip/knee complaints and 3 (5.5 %) mentioned other health complaints as reasons for not working.

Within the groups statistically significant differences between T_0 and T_2 were found for age (obviously both groups were 2 years older at T_2), and in the 'still working' group scores on WOMAC pain and WOMAC stiffness decreased (Table 2). Also, statistically significant decreases between T_0 and T_2 were found for visiting a general physician (in both groups) and visiting a physical therapist and rheumatologist in the group 'still working' (Table 3).

At follow-up 29 of the 428 working subjects (6.8 %, compared to 7.7 % at T_0) reported being on sick leave at the moment of filling the questionnaire, six of them because of hip/knee complaints (1.4, vs. 2.2 % at T_0). 48 Subjects had been on sick-leave in the past 12 months because of their hip or knee complaints (11.2 %, compared

Table 3 Comparison of health care consulting, sick leave and work demands of subjects still working and subjects who stopped working, both at T_0 and T_2

	Still working n = 414 Proportion	Stopped working n = 61 Proportion	Stopped—Still working Mean difference (95 % CI)
Contact with			
General physician			
T_0	38 %	34 %	−4 % (−16 to 9 %)
T_2	9 %	7 %	−3 % (−5 to 1 %)
Physical therapist			
T_0	21 %	21 %	0 (−11 to 10 %)
T_2	15 %	11 %	−3 % (−5 to 1 %)
Rheumatologist			
T_0	7 %	7 %	0 (−6 to 7 %)
T_2	2 %	3 %	1 % (−3 to 5 %)
Orthopedic			
T_0	4 %	5 %	1 % (−5 to 6 %)
T_2	6 %	2 %	−4 % (−10 to 2 %)
Occupational physic			
T_0	0 %	0 %	0
T_2	4 %	2 %	−2 % (−8 to 3 %)
	Numbers	Numbers	
At sick leave now (T_0)			
No	381	49	$\chi^2 = 17$; $P = 0.000$
Yes, because hip/knee	8	2	
Yes, other complaints	16	10	
Been at sick leave because of Hip/Knee (T_0)			
No	362	56	$\chi^2 = 0.5$; $P = 0.316$
Yes	48	5	
Education (T_0)			
Low	10	0	$\chi^2 = 3.0$; $P = 0.37$
Medium	267	43	
High	137	18	
Physical demands (T_0)			
Kneel/squat long			
Seldom or never	276	37	$\chi^2 = 0.47$; $P = 0.925$
Occasional	87	14	
Often	28	4	
(Almost) always	11	1	
Handle heavy loads			
Seldom or never	297	45	$\chi^2 = 2.7$; $P = 0.440$
Occasional	59	7	
Often	25	4	
(Almost) always	16	0	
Knee bending			
Seldom or never	144	20	$\chi^2 = 0.74$; $P = 0.864$
Occasional	141	20	
Often	104	17	
(Almost) always	14	1	

Table 4 Work adaptations made and desired by working subjects (n = 493 at T_0, n = 428 at T_2)

		Subjects reporting adaptations		Total no. of adaptations	Type of work adaptation:			
					Less hours	Other/ less tasks	Work place/aids	Work Technique
Work adaptations have been made because of my hip/knee complaints	T_0	N (%)	67 (14)	77 (100)	29 (38)	8 (10)	19 (25)	21 (27)
	T_2	N (%)	86 (20)	92 (100)	29 (31)	21 (23)	18 (20)	24 (26)
I would like to have my work adapted because of my hip/knee complaints	T_0	N (%)	146 (30)	176 (100)	61 (35)	43 (24)	48 (27)	24 (14)
	T_2	N (%)	109 (26)	122 (100)	40 (33)	28 (23)	27 (22)	27 (22)

to 12.4 % at T_0). Compared to baseline there was an increase in the proportion of working subjects who reported adaptations to their work (Table 4).

Negative experiences regarding work and career because of hip or knee complaints and because of other health complaints were mentioned by very small numbers of subjects. Difficulty finding work (1.4 % for hip/knee complaints and 1.7 % for other complaints, respectively), change of function (1–6 %), becoming unemployed (0.5–1.9 %), being refused a job (0.5–1.0 %) and being refused after an assessment (0.2–0 %) were reported. Only the other health complaints were reported by some as reason for being fired (1.9 %), being refused promotion (1 %) and being refused from insurance (2 %).

Discussion

Participation in paid work in the CHECK cohort decreased from 51 to 46 % in the 2 years following inception. This was similar to the general Dutch population, matched for age, sex and education level. Subjects who stopped working were 4.2 years older than those still in the labor force and they had reported a higher level of sick-leave at baseline. However, at follow-up only a few reported hip/knee problems or other health problems as reason for not working. Among the subjects who were working at T_2, sick leave because of hip/knee complaints or other health complaints was similar to baseline, but work adaptations increased. In all subjects the number of visits to health care professionals decreased.

A clear effect of OA on work participation may have been concealed by the fact that this participation rate is less than 50 % anyway. In the Dutch generation of the CHECK cohort (45–65 year at baseline) many people older than 55 were financially facilitated by employers and by the state to retire early, that is: at an earlier age than 65. In fact, 18 % of the respondents aged 56–64 indicated that they had retired. However, there are differences per industrial branch which make valid comparisons difficult. Furthermore, in the general population several other health conditions than OA may have influenced work participation rates. A traditional family role-division in the generation under study, with men as breadwinners, also contributed to a relatively low work participation of women. These socio-economic factors may explain the low work participation in Dutch people older than 50 and all together mask the possible impact of OA. The current political trend in the Netherlands is to stimulate work participation (more working women, longer working life). This may lead to a more manifest effect of OA on work in the future. Many women in our study did not do paid work, but obviously their work in and around the house may be influenced. However, this was beyond the scope of our study.

Hip or knee problems only played a minor role in the decision of 61 subjects to give up work, whereas age played the major role. On average the self-reported health status and more specifically the physical function of all subjects hardly changed from baseline, which may explain this observation. Physical demands in the work (at baseline) of both groups were not different either. The 61 subjects who stopped working had reported a high sick-leave rate (16 %) at baseline, but this was because of other health complaints than OA. This demonstrates that co morbidities may have affected the subjects' functioning and also that the sick-leave was probably not determined by a single factor. Although only a few subjects mentioned their health as reason for not working, this previous period of sick leave may have contributed to their decision to give up working.

The impact of OA on work may increase with disease progress and duration [7]. In the end stage, successful return to work has been described in some patients after total joint arthroplasty [21]. Considering this, our data are the first on participation issues in the early disease stage [10]. An important strength of this study was that it concerned a large inception cohort on suspected early OA, including both working and non-working subjects. Confounding by over representation of older subjects with many co morbidities, for which studies on the impact of OA on work may be prone [22, 23] was eliminated in our study design. Our data seem to reveal early indicators of the impact of hip and knee complaints on physical function and work participation and of the measures that people try to take to cope with these circumstances. The observation

that visits to health care professionals have decreased at T_2 may support the hypothesis that patients, after being told their diagnosis, indeed try to cope with their complaints [10].

Twenty percent of the subjects reported having made changes in their work because of their hips or knees. This figure has increased compared to baseline and still some more subjects would like their work to be adapted. Changing one's work may be an action that precedes sick leave or that is taken in order to prevent this [7]. Worksite health interventions can support this preventive aim. They should include ergonomic work-place improvement, but also educational and counseling approaches aimed at improving coping style and behavior of workers with OA [24, 25].

Loss to follow-up is a threat in longitudinal cohorts, but was restricted in the CHECK study and, moreover, not selective for example for working participants. Unfortunately, in this study there was a relative lack of information on psychosocial work conditions and on the involvement of employers in work adaptations. This was due to the broad set-up of the cohort study, that was chosen to cover a wide range of topics. This kind of information would be relevant for a further exploration of the process of work continuation, sick-leave and work adaptations.

It appears that identifying those individuals who report the desire to adapt their work, and who may be vulnerable to the effect of OA on their working capacity, is a challenge for research and for clinicians in the fields of rheumatology and occupational health. In this way needless disability may be prevented. Because of the earlier mentioned political aim to increase work participation and considering the stricter rules for the assessment of work disability claims, patients should be aware of the importance of maintaining their functional capacity. This requires efforts from patients themselves, their health care providers and their employers.

In conclusion, the 2-year course of work participation in early OA of hip and knee is similar to that in the general population, but the disorder starts to have an impact on the late stage of peoples' working life. Regarding the high prevalence of OA this impact may hamper the objectives of increasing the participation rate and of lengthening the working life period. Follow-up measurement in the cohort and longitudinal studies on younger generations (who are used to the prospect of working longer and have different family role divisions) may clarify how the early signals of OA impact on work should be interpreted. To enable people to stay at work, for example by facilitating work adaptations, is an important objective for human resource managers and for both general and occupational health professionals.

Acknowledgments CHECK is funded by the Dutch Arthritis Association on the lead of a steering committee comprising 16 members with expertise in different fields of OA chaired by Prof. J.W.J.Bijlsma and coordinated by J.Wesseling, MSc. Involved are: Academic Hospital Maastricht; Erasmus Medical Center Rotterdam; Jan van Breemen Institute/VU Medical Center Amsterdam; Kennemer Gasthuis Haarlem; Martini Hospital Groningen/Allied Health Care Center for Rheumatology and Rehabilitation Groningen; Medical Spectrum Twente Enschede/Twenteborg Hospital Almelo; St. Maartenskliniek Nijmegen; Leiden University Medical Center; University Medical Center Utrecht and Wilhelmina Hospital Assen. This work was supported by NutsOhra Fonds (SNO-T-08-80) and Mobiliteitsfonds HBO (PR0512-C).

Conflict of interest The authors declare no conflicts on interest.

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